International Journal of Computer Networking,
Wireless and Mobile Communications (IJCNWMC)
ISSN(P): 2250-1568; ISSN(E): 2278-9448
Vol. 6, Issue 2, Apr 2016, 29-36

SCHEDULING WITH IMPROVED BFCA-VF IN OBS NETWORK

PRAJAPATI VIPUL DASHARATHBHAI[1], HARDIK JAGAD[2] & PINAKINI PRAJAPATI[3]

[1]*ME Pursuing, Department of Computer Engineering, Government Engineering College, Modasa, Gujarat, India*

[2]*Assistant Professor, Department of Information Technology, Government Engineering College, Modasa, Gujarat, India*

[3]*ME, Department of Electronics and Communication, S. V. B. I. T, Gandhinagar, Gujarat, India*

ABSTRACT

Routing algorithms have effective part on the quality of service. Scheduling with better quality of service is required for the efficient network. In the recent literature non segmentation based scheduling algorithms, algorithm with void filling algorithm give better result than horizon. BFVF algorithm gives better result with segmentation and void filling base which called as BFCA-VF algorithm. Rescheduling will increase throughput of network and reduce burst loss but include process overhead. In this paper improved BFCA-VF algorithm with fiber delay line is introduced. With fiber delay line performance is improve in OBS network without increase process overhead.

KEYWORDS: BFVF, FFUC-VF, Fiber Delay Line, Improved BFCA-VF, LAUC-VF, OBS

Received: Mar 18, 2016; **Accepted:** Mar 31, 2016; **Published:** Apr 08, 2016; **Paper Id.:** IJCNWMCAPR20164

Original Article

INTRODUCTION

Now days as network demand is increase, to achieve this Optical Circuit Switched (OCS) Network is used. In OCS dedicated wavelength for data flow so resource utilization is very low. Optical Packet Switching is another solution for this increasing demand. In OPS network packet and data have different wavelength for flow [1]. It required Fiber Delay Line, which is drawback. Optical Burst Switched Network is introduced which overcome drawback of both the OCS and OPS.

OBS network contains ingress, egress and core node. Here in figure 1 functional diagram of OBS network is shown [2]. Ingress node is the interface between electronic and optical domain. At the ingress node data are assembled and pass through core node. Data disassemble at the egress node. Assembled data contain different data like IP, ATM or GbE.For reservation Just Enough Time and Just In Time protocol is used in OBS Network. Burst scheduling algorithms determine which outgoing link is assigned for corresponding data burst. For contention resolution (i) Fiber delay line (ii) Deflection routing (iii) Wavelength Conversion and (iv) Burst Segmentation are used. [3,4] Fiber delay line is the way to solve the contention in time domain In this the data send through the optical fiber delay line so optical buffering is done. Some of the contending data pass through the fiber delay line. Contention occurs when one or more data burst searching to reserve the same wavelength channel on a destination side link. In electronic network, contention is avoided by the contending packets. As there is no any acknowledgement, reservation must be done before transmission.

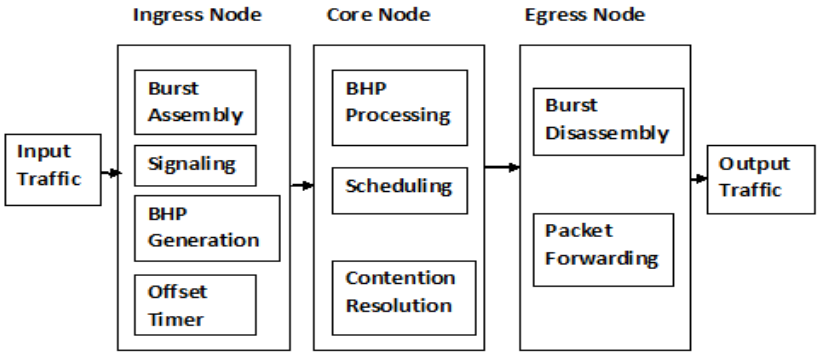


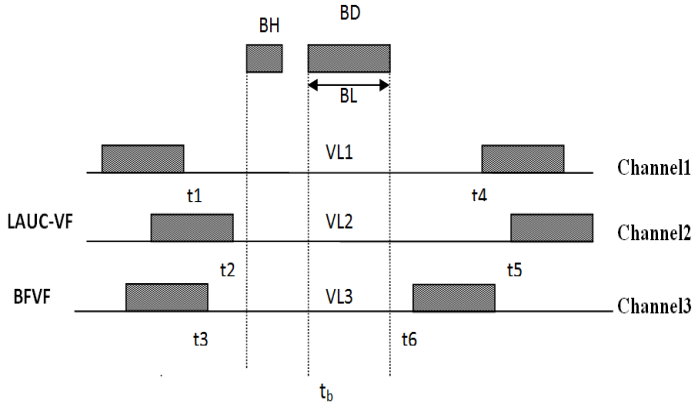
Figure 1: Functional Diagram of OBS Network [2]

In optical network it can be resolved in the time domain, space domain and wavelength domain. [3] Deflection routing is used without the optical buffer in space domain. Here the data burst is sent to different output port and then follow other route for destination to avoid contention. It has advantage that it not requires any additional hardware. Burst contains so much number of segments. Burst segmentation is a technique to reduce packet loss rather than burst loss. In this contending region is dropped in place of the whole burst. It gives the good performance in the case of packet loss. The first approach, tail dropping tail is drop if contention occurs as vice versa head drop in the second approach, as contending burst. Here process overhead becomes higher.

RELATED WORK

Burst Scheduling algorithms decide the routing of the incoming burst. It is of two types: (1) Horizon Scheduling (2) Void Filling Algorithm [5,6]. Horizon Scheduling algorithms are First Fit Unscheduled Channel and Latest Available Scheduling Algorithm. As horizon scheduling does not consider void on the outgoing channel. So there is no better bandwidth utilization. In literature Latest Available Unscheduled Channel (LAUC-VF), Void Filling and First Fit Unscheduled Channel (FFUC-VF) and Best Fit Channel Allocation (BFCA-VF) Void Filling algorithms are examples of void filling algorithms[6,7,8]. As the void is counted in void filling algorithms so the resource utilization is more. From these different algorithms drawback of LAUC-VF algorithm is it only consider void at one side [6,11]. BFVF algorithm allocate burst with maximum utilization factor. It allocate burst with best link utilization factor.

To improve result in BFVF algorithm segmentation and rescheduling is done in BFCA-VF algorithm is introduced [9]. But because of rescheduling process overhead is increase. In this paper improved BFCA-VF algorithm with Fiber Delay Line is introduced for the contention resolution. In figure 2 we have illustrated LAUC-VF and BFVF algorithm. As burst header (BH) arrive it search to schedule burst. As per LAUC-VF algorithm on which channel end time of scheduled burst and incoming burst is less is allocated. Here ($t_b - t_1$), ($t_b - t_2$), ($t_b - t_3$) are count and for LAUC-VF algorithm as ($t_b - t_2$) is less than two other channel2 is allocated for Burst Data(BD). Here void is search only at one side so utilization is low. In BFVF algorithm utilization factor is count for every channel. In figure Void Length measured as (VL1=t4-t1),(VL2=t5-t2) and (VL3=t6-t3). As per BFCA-VF algorithm on which utilization factor is highest is allotted. In figure Channel3 give more utilization factor than Channel1 and Channel2, so channel 3 is allocated for burst in BFVF algorithm.



BH=Burst Header

BD=Burst Data

VL=Void Length

BL=Burst Length

Figure 2: Illustration of LAUC-VF and BFVF Algorithm

Even after this utilization factor there is void which is not utilize. To overcome BFCA-VF algorithm is introduced in which rescheduling is done with segmentation. As data burst are divided in small part burst headers are increased and overhead process is also increased as decision of routing is on incoming burst. To overcome drawback of BFCA-VF and for increase the utilization BFVF with fiber delay line is introduced.[9] Here if there is no void gap for given burst it pass through fiber delay line. Also we schedule the control burst with BFVF algorithm in place of First Fit Unscheduled algorithm which is default in obs-ns simulator. So After applying Fiber Delay Line and BFVF in control burst scheduling result is improved in BFCA-VF with fiber delay line. To improve the results batch scheduling algorithm also can be used. But complexity increased and it is 3% slower than faster algorithm in literature [10]. Here in proposed algorithm at the third stage of BFCA-VF with fiber delay line is taken so process overhead problem can be neglected and we get better output.

PROPOSED ALGORITHM

Improved BFCA-VF Algorithm: we have divided this algorithm into three steps. These three steps are as described below.

Step 1: Find best fit channel (bfc) using burst arrival time (attime), required bandwidth (rbw), required time slot (rts), burst size(bs), and channel list(chlst) as we find in LAUC scheduling algorithm.

Step 2: If best fit channel is not found then try to find channel that are already scheduled but having voids (idle times), if found then tracks all suitable channels to schedule burst in one of founded void by calculating utilization factor such that utilization factor is highest among all but less than or equal to 100.

$$n = (a*100)/x$$

Where n is utilization factor, a is data burst length, and x is void length[11].

Step 3: If not possible to schedule using void, then schedule using the fiber delay line such that after delay line such that after delay utilization factor is as higher as possible, but less than or equal to 100.

As shown in Figure 2, any existing algorithm can not schedule the new arrived burst in given channels. But if we apply improved BFCA-VF algorithm then we can see that after adding Fiber Delay Line the new arrived burst can be scheduled in Channel 3.

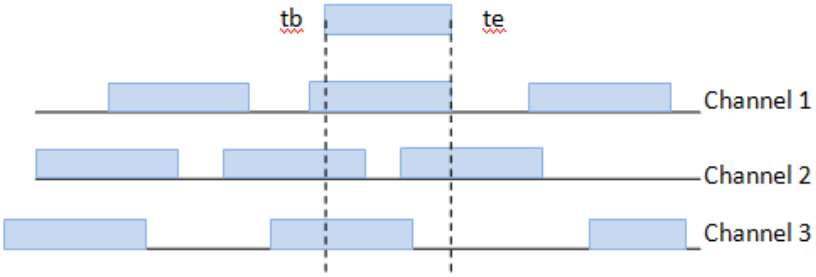


Figure 3: Failure of Existing Scheduling Algorithms

SIMULATION AND RESULTS

All the results are taken with obs-ns[12] simulator which is run on top of NS2[13]. Here we compared the bench mark LAUC-VF algorithm and improved BFCA-VF algorithm. Topology considered for the simulation is as shown in figure 4. As the data burst size and channel number increase burst loss ratio decreased and throughput is increase. Here burst loss ratio is taken as ratio of burst drop to burst send. Throughput is taken as successfully bytes received in given time. Here 8 and 9 node is core node. All the results are taken in respect with core node.

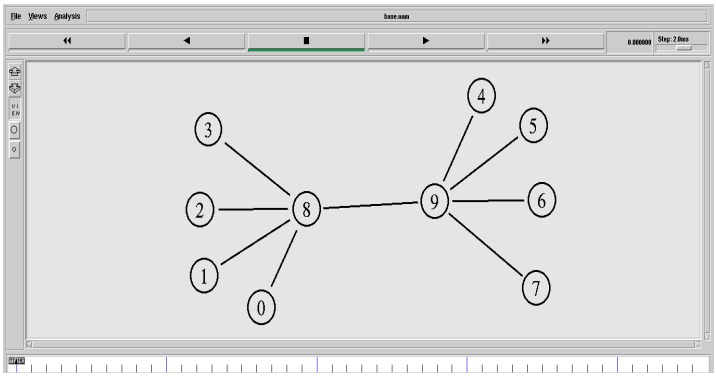


Figure 4: Topology Considered for the Simulation

Here in Figure 4 topology is simple. For analysis work of the algorithm one can use any topology. Here burst flow between source-destination pair 0-4, 1-5, 2-6, 3-7 through 8-9 core network. As load increase at core node 10gbps link is taken in between 8-9, where other links are of 1gbps. As data channel increase more channel are available for burst routing so burst loss ratio is decrease and as more data bytes successfully in given time throughput increase. For burst generation self similar traffic given to each source edge. In simulation analysis burst size kept as 50kb. As we increase burst size without increase in data channel burst header dropped at edge itself. It will not forward to core node. If we increase data channel cost is also increased, so after some limit it is undesirable to give more data channels. We have different parameters as shown in table 1.

Table 1: Simulation Setup

Parameter	Value
Processing time of control packet	1.5µsec
Number of FDL	1
Edge Node	8
Core Node	2
Bandwidth/channel	1gbps
Bandwidth/channel(core network)	10 gbps
No. of control channels/link	1
Channels per link	6
Data channels/link	5
Burst Size	50kb
Traffic	Self similar

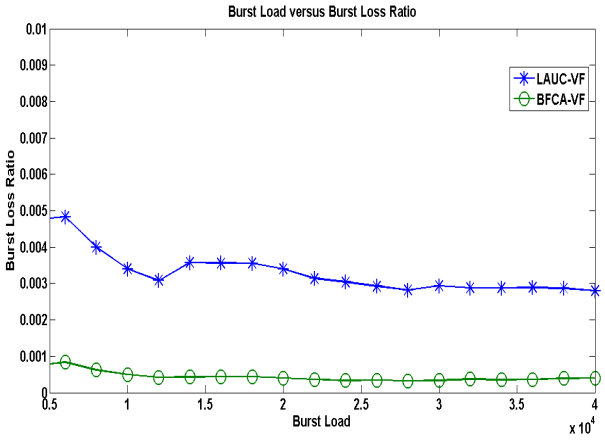


Figure 5: Burst Loss Ratio vs Load for Algorithms

As indicated in Figure 5 burst loss ratio for LAUC-VF and improved BFCA-VF is shown. As fiber delay line introduced burst loss ratio is decrease. In our improved BFCA-VF algorithm void utilization factor is count which gives less burst loss ratio as compared to LAUC-VF algorithm. In LAUC-VF algorithm void of only one side is count for the channel allocation. So burst loss ratio is decreased. In BFVF without Fiber Delay Line gives 0.03 burst loss ratio [11] at 5000 burst send where with fiber delay line we get 0.008 burst loss ratio which is improvement over BFVF algorithm. At the same time throughput is also increased in our improved BFCA-VF compare to bench mark LAUC-VF algorithm as shown in figure 6.

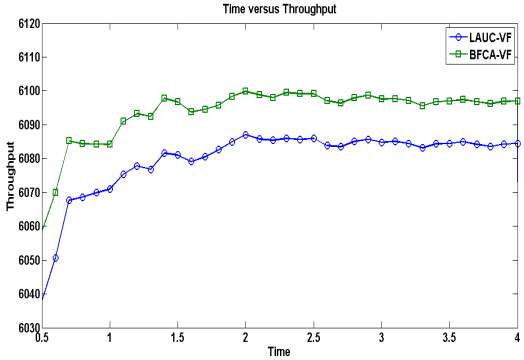


Figure 6: Throughput vs Time for Algorithms

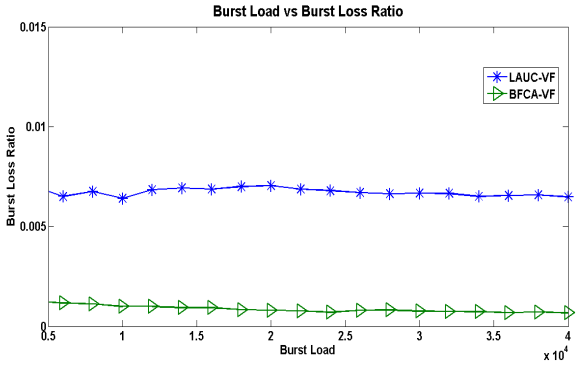


Figure 7: Burst Loss Ratio vs Load for Algorithms

Here we can take comparison of scheduling algorithm by different burst size and different channel. As shown in table 1 taking other parameters same and change the burst size and data channel we can verify results for algorithm. We take 40 kb burst size and 5 data channels.

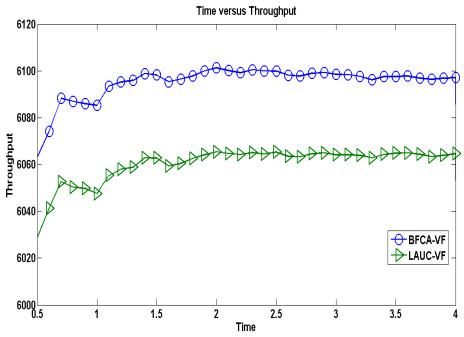


Figure 8: Time Versus Throughput

Here channels per link is summation of data channel and control channel. As indicated in figure 7 even after changing burst size and data channel improved BFCA-VF gives low burst loss ratio than LAUC-VF. Here as burst size decrease burst loss ratio increased. Throughput decreased as burst size decrease. This effect can be seen by comparing figure 6 and figure 8. Burst loss ratio is one of the best parameter by which we can determine performance of OBS network. For verification one other combination with 50 kb burst and 6 data channel is taken. Figure 8 shows burst loss ratio comparison of scheduling algorithm for this combination. As burst size increase burst loss ratio decreased.

CONCLUSIONS

In BFVF algorithm void is utilized more than the horizon and void filling algorithms. Its complexity is also simple as compared to batch scheduling algorithm. By using Fiber Delay Line and utilization factor in improved BFCA-VF in place of burst segmentation in BFCA-VF improve the result of network. Here it is not necessary for burst rescheduling and segmentation, so process overhead is less. So in this paper network result improve compared to other scheduling algorithms. In future we can analyze this algorithm with different parameters.

ACKNOWLEDGEMENTS

For this work we are thanks to Dr. Geoffrey M. Garner to share “OBS Simulation Tool and Architecture Based on ns-2, VG presentation prepared for SAIT, March 8, 2004.”And also want to thanks Mrinal Nandi for give way to this research.

REFERENCES

1. *J.Turner, "Terabit burst switching," Journal High Speed Networks, vol.8, pp.3-16, 1999*
2. *Pushpendra Kumar Chandra, Ashok Kumar Turuk and Bibhudatta Sahoo, "Survey on Optical Burst Switching in WDM Networks", IEEE, 2009*
3. *Chen, Y. and Qiao, C. and Xiang, Y., "Optical Burst Switching (OBS): A New Area in Optical Networking Research", Ihat the burtEEE Network 18, 2004*
4. *Yijun Xiong, Marc Vandenhoute, and Hakki C. Cankaya, "Control Architecture in Optical Burst-Switched WDM Networks, IEEE Journal On Selected Areas In Communications", Vol. 18, No. 10, October 2000*
5. *Rohit Lamba,Dr.Amit Kumar Garg, "Performance Analysis of Scheduling Algorithms In Optical Burst Switching Networks", International Journal of Advanced Research in Computer Science and Software Engineering,2012*
6. *Marije Ljolje, Robert Inkret and Branko Mikac, "A Comparative Analysis of Data Scheduling Algorithms in Optical Burst Switching Networks",IEEE,2005*
7. *Vinod M. Vokkarane and Jason P. Jue, "Segmentation-Based Nonpreemptive Channel Scheduling Algorithms for Optical Burst-Switched Networks" Journal Of Lightwave Technology, Vol. 23, No. 10, October 2005*
8. *Jinhui Xu, Chunming Qiao, Jikai Li, and Guang Xu "Efficient Channel Scheduling Algorithms in Optical Burst Switched Networks" IEEE INFOCOM 2003*
9. *Venkata Rao Tavanam, D.S. Venkateswarlu,Karuna Sagar Dasari, "BFCA-VF: Best Fit Channel Allocation and Void Filling by Burst Segmenting and Scheduling", IEEE International Conference on Recent Advances and Innovations in Engineering (ICRAIE-2014),May,2014*
10. *Gustavo B. Figueiredo, and Nelson L. S. da Fonseca, " Algorithm with linear computational complexity for batch scheduling in OBS networks", IEEE ICC 2011*
11. *M. Nandi, A. K. Turuk, D. K. Puthal and S. Dutta, "Best Fit Void Filling Algorithm in Optical Burst Switching Networks" Second International Conference on Emerging Trends in Engineering and Technology, IEEE, ICETET-2009 International Journal of Electronics and Communication Engineering",ISSN 0974-2166 Volume 5, Number 2 (2012), pp.143-149*
12. *obs-ns Simulator. http://www.wine.icu.ac.kr/ obsns/.*
13. *ns2 Simulator. http://www.isi.edu/nsnam/ns*

AUTHOR DETAILS

Vipul Prajapati, received the B.E. degree in Computer Engineering at Vishwakarma Government Engineering College in 2014 and pursuing M.E. degrees in Computer Engineering at Government Engineering College Modasa.

Pinakini Prajapati, received the B.E. in Electronics and Communication in 2013 and M.E. in Electronics and Communication in 2015 at Shankersinh Vaghela Bapu Institute of Technology.

Hardik Jagad, received the B.E. degree in Information Technology from Shantilal Shah Engineering College, Bhavnagar in 2011 under Bhavnagar University and Master of Engineering (M.E.) degree in Computer Engineering from Atmiya Institute of Technology and Science, Rajkot under Gujarat Technological University in 2013.Currently working as Assistant Professor in Information Technology Department at Government Engineering College Modasa.